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Food Prices and Rising Energy Costs

Floyd A. Lasley

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FOOD PRICES AND RISING ENERGY COSTS. By Floyd A. Lasley, National Economics Division, Economic Research Service, U.S. Department of Agriculture. ERS-674.

ABSTRACT

Food processors spent nearly 5 cents for fuel per each dollar of value added by manufacture in 1977--double the amount spent in 1972 and 1967. This study suggests that measuring energy costs as a percentage of the value added by production or manufacture and as a percentage of labor and management earnings may be better than the commonly used measurement of energy costs as a percentage of cash sales or expenses.

Key words: energy, food prices, marketing costs

CONTENTS

Washington, D.C. 20250 February 1982

SUMMARY

Rising fuel costs may have a greater impact on all levels of the food production-marketing chain than commonly used measures have indicated.

Food producers and manufacturers need an accurate method of measuring the impact of rising energy prices. The methods commonly used today measure fuel costs as a percentage of cash sales or expenses. The alternate methods recommended in this study measure energy costs as a percentage of the value added by production or manufacture and as a percentage of labor and management earnings.

How an increase in energy cost is measured will affect the pressures on producers and processors to adjust their operations in response to rising fuel prices. This study finds that the commonly used methods tend to err on the low side. For example, the common measurements, by placing fuel costs at only 2.5 percent of beef producers' cash sales, lead to the conclusion that doubling energy prices would not have much effect at either the farm or retail level. However, the new measuring methods show that fuel costs for beef producers were equal to 44 percent of the value added by production--the difference between cash sales of farm products and cash farm expenses. In effect, doubling fuel costs would reduce cash available to beef producers for other purposes by 44 percent.

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INTRODUCTION

Modern methods of producing, processing, and distributing food depend heavily on energy use. Much of the high productivity of farm labor and land hinges on fuel and energy, even though farmers use only about 3 percent of the Nation's energy in the production process, including that invested in agricultural chemicals and other inputs. About four times this amount is used to assemble, process, distribute, and prepare food for consumers.

Increases in energy prices will affect food prices in four ways: (1) each unit of fuel used costs more; (2) constraints upon the availability of energy may lead to decreased food production; (3) constraints upon certain types of fuels could lead to use of higher cost fuels; (4) limited availability and rising prices could lead to the substitution of other inputs (such as labor) for energy.

Each of these adjustments could cause a rise in the production and marketing cost of a unit of food. Rising real costs will be reflected in higher real prices for products, but the passthrough of cost increases in the form of higher nominal prices is not automatic. If the economic system accommodates these cost increases, they will be passed through the production-marketing system and food prices will increase. However, prices of different foods will not rise uniformly in degree or timing, even assuming constant food demand and output mix. Real prices will be bid up for those products requiring relatively more energy--or energy from a higher priced alternative. This study does not measure impacts caused by the fact that different activities consume varying proportions of fuel types. Changing cost-returns relationships affect the ability to attract and maintain productive resources in the various food sectors. This may also contribute to increasing price volatility.

This study finds that the commonly used methods of measuring the effect of fuel costs on food prices may understate the impact on retail prices if fuel prices were to double. Instead of measuring fuel costs as a percentage of cash sales or expenses, this study suggests that energy costs as a percentage of the value added by production or manufacture and as a percentage of labor and management earnings may be better measurements.

FUEL IN PRODUCTION AND MARKETING

Current food production and marketing technology were developed largely during the era of low-priced energy. While essential for current high-technology processes, energy has represented only a small part of the total cost of producing, processing, and distributing food. Labor, land, and equipment each are more costly, and have limited food production and marketing more than has energy.

Historically, the price of energy did not heavily influence the output of most food processing industries; low-priced energy enhanced productivity and provided savings in total unit costs. Even during fuel shortages, food processing and distribution have received high-priority fuel allocations. Barring an extreme crisis, these industries process and market the quantity of food

available, although there may be some adjustment of product mix and both inputs and methods may be selected primarily to minimize costs.

Estimates based on energy cost at a particular sector (farm, processing, wholesaling, or retailing) compared with the sales or shipments by that sector tend to understate energy's impact on prices. Energy is used in all stages, and meaningful estimates must consider how energy contributes to cost at each level. Increases in cost are cumulative as the product moves through the production-marketing system.

The following comparisons assume that fuel will be available for producing and marketing foodstuffs, that output will not be changed, and that physical inputs will be used in about the same proportions as in the immediate past in each level of the system. It is also assumed that price increases can be passed on to the consumer. These simplifying assumptions do not deny that adjustments would be expected in all areas, but they illustrate the pressures for food price adjustments resulting from increasing energy prices. Questions regarding management decisions to alter output, product mix, and input combinations are not addressed in these comparisons.

MEASURING FARMERS' FUEL COSTS

Farmers, for whom energy is a critical input, will face higher production costs as fuel prices rise. How one expects farmers to adjust to higher fuel prices will be influenced by how the impact of fuel price increases is measured. The importance of energy costs to production costs for six types of farms is illustrated by selected cost and returns data (table 1). While considerable variation exists between individual farms in a given community and from State to State, these data provide insight into the anticipated impacts on commodities as energy prices rise.

Dairy and broiler farm expenditures for energy in 1978 were about 5 percent of total cash sales, while egg and beef producers spent only one-half this amount (table 1). This measure, perhaps the one most commonly applied, could lead one to conclude that doubling energy prices would not have much effect on either farmers or food prices. Fuel costs as a percentage of cash farm expenses is another frequently used measure at the producer level. As expected with this comparison, fuel costs are slightly greater than when measured as a proportion of cash receipts (table 1). Both of these measures, although frequently used, understate the significance of fuel costs and their impact on returns to farmers.

Comparing fuel costs with cash balances and labor and management earnings reveals that uncompensated rising fuel costs would have considerably more impact on net returns than on total costs. Although not strictly the same as "value added by manufacture," cash balance, the difference between cash sales of farm products and cash farm expenses, is used here to represent "value added" by farm production. Fuel costs in 1978 were equal to 44 percent of the cash balance for beef producers. Without compensating adjustment, doubling fuel costs would reduce cash available for

Table 1--Relationship of fuel and energy costs to sales and returns for six types of farms, average per farm

Item	Type of farm					
	Dairy	Beef 1/	Hog	Egg 2/	Broiler 3/	Grain
			Number			
Farms	340	189	678	--	--	2,002
			Dollars			
Cash sales of product	130,577	313,412	207,664	259,560	92,736	150,704
Cash expenses	101,204	295,930	166,337	208,260	66,624	90,991
Cash balance (value added) 4/	29,373	17,482	41,327	51,300	26,112	59,713
Labor and management earnings	22,642	13,553	31,456	16,980	15,456	17,217
Purchased fuel and energy 5/:						
1971	2,400	2,746	1,899	--	--	2,616
1978	6,509	7,733	8,643	6,600	4,512	6,255
			Percent			
Purchased fuel and energy as a proportion of:						
Cash sales--						
1971	4.8	1.9	2.5	--	--	3.8
1978	5.0	2.5	4.2	2.5	4.9	4.2
Cash expenses--						
1971	6.4	2.2	3.3	--	--	6.1
1978	6.4	2.6	5.2	3.2	6.8	6.9
Cash balance (value added)--						
1971	18.6	13.9	11.7	--	--	10.5
1978	22.2	44.2	20.9	12.9	17.3	10.5
Labor and management earnings--						
1971	39.4	27.4	23.5	--	--	18.6
1978	28.7	57.1	27.5	38.9	29.2	36.3

-- = Not available.

1/ Beef farms include cow-calf operations but are heavily weighted by farms feeding out beef (not commercial feedlots).

2/ Includes total production estimates for 30,000 hen egg production units.

3/ Includes total production estimates for 96,000 broilers per year production units. Comparable results would be expected from larger units.

4/ Cash balance is shown in Illinois farm records as the difference between cash sales of product and cash expenses. This difference is later used as a proxy for value added by farming.

5/ Purchased fuel and energy estimated by adjusting farm record summaries to aggregate fuel costs including gasoline, oil, electricity, natural and propane gas, fuel oils, diesel, fuel portion of hired machine work, and fuel portion of hired transport.

Source: 1971 and 1978 issues of "Summary of Illinois Farm Business Records" for dairy, beef, hogs, and grain farms. Unpublished data and budget estimates compiled by NED, ERS, for egg and broiler producers.

Note: Data are for 1978 unless otherwise indicated.

other purposes by 44 percent of the cash balance. Milk and pork producers would see their cash balances reduced about 20 percent by a doubling of fuel costs. The proportion is about 17 percent for broiler producers, 13 percent for egg producers, and 10 percent for grain farmers.

IMPACT OF FUEL PRICE INCREASES ON FARM COSTS

The severity of the impacts caused by a doubling of fuel costs can best be seen by looking at the potential effect on labor and management earnings. Unless product prices increased, doubling fuel costs at the producer level would cut earnings by more than half for beef producers, by more than one-third for egg and grain producers, and by more than one-fourth for broiler, milk, and pork producers. Such changes in the relative well-being of these various producers are likely to result in differential changes in production and product prices. If these producers were near equilibrium positions in 1978, then beef producers would be more severely affected than pork producers by rising fuel costs.

A similar comparison for 1971 showed that fuel costs were equal to about 25 percent of labor and management earnings for both beef and hogs, but nearly 40 percent for dairy (table 1). This emphasizes that the impact of rising fuel prices on producers of farm products will be influenced by the current stage of existing price cycles for those products. It also suggests that rising fuel prices may add further instability to producer earnings, thereby resulting in greater volatility in commodity price cycles and quantities produced. At any rate, one should expect different price and producer response to rapidly rising fuel costs for various commodities.

Cash expenses grow in significance as farmers purchase increasing proportions of inputs from off-farm sources. In 1978, milk, pork, and egg producers spent about four-fifths of each dollar received for cash expenses. Beef producers spent the highest portion, 94 percent of each sales dollar, while grain farmers, at 60 percent, spent the lowest. Thus, a change in the price of any input becomes critical for farmers' cash balance, labor and management earnings, and living standards. Although the cost of fuel is a relatively small proportion of total farm sales, the impact of rising fuel prices on net earnings and living standards will influence producers' decisions and affect the price of farm products.

High fuel prices would also influence costs of production for farmers by increasing the cost of purchased inputs other than fuel. The fuel cost for all manufactures, as reported by the Census of Manufactures, provided a suitable approximation of the fuel cost of purchased inputs. The cost and impact on these inputs was not differentiated. The average fuel cost for all industries in 1977 was 2.46 percent of the value of shipments, up from 1.38 percent in 1967 and 1971. This 2.46 percent was used as the fuel cost of inputs purchased by farmers, except for beef and pork costs, which were adjusted to account for the purchase of farm-produced feeder livestock. Thus, rising fuel

prices were assumed to increase the prices of inputs purchased by farmers by 2.46 percent of the purchase price.

FUEL PRICES AND THE FOOD INDUSTRIES

Farm products tend to be bulky per unit of value, but they require far less processing than the average manufactured product.1/ Value added by manufacture averaged 43 percent of the value of shipments for all industries in 1977 (table 2). Food and kindred manufacturing added an average 29 percent, with the fats and oils, meatpacking, and dairy products industries adding 13, 16, and 22 percent, respectively. Bakery products were highest, with 58 percent of the value of their shipments added by manufacturing. The meatpacking (at 0.5 percent) and dairy products (at 0.8 percent) industries purchased less energy per dollar value of shipment than any of the other major (3-digit Standard Industrial Classification [SIC]) food industries. Primarily as a result of rising dairy product prices and energy-conserving adjustments by the dairy industry, dairy product manufacturers spent less for fuel per dollar of sales in 1977 than in 1967. The dairy products industry was the only major food industry to experience such a decline. The sugar and confections industry was the only 3-digit food industry spending more than 2 percent of sales to purchase fuel and energy.

Fuel cost per dollar of value added by manufacture at each stage provides a more useful measure of fuel cost's importance than does fuel cost per dollar value of shipments. The average fuel cost per dollar of value added by all manufactures was 5.7 cents in 1977, up from about 2.9 cents in 1967 and 1972 (table 2). The ratio for food and kindred products was somewhat lower, with a value of 4.5 cents in 1977 and 2.5 cents in 1967 and 1972. Fats and oils (SIC 207) and sugar and confections (SIC 206) both required relatively large expenditures for fuel per dollar of value added, with grain milling and dairy products about average for all manufactures. Meat products' (SIC 201) fuel cost per dollar of value added ran at about the average for all food products (SIC 20).

Smaller groupings of industries (4-digit SIC codes) present more classification and allocation problems. Although assigning costs at various levels may not be accurate due to these problems, some of the differences among these subindustries appear significant. In 1977, the butter industry (2021) spent more than 10 cents for fuel for each dollar of value added by manufacture. Fluid milk processors spent only 4 cents and cheese manufacturers just over 6 cents in this category. Rising fuel prices would thus tend to be more of a problem for butter manufacturing than for fluid milk processing. Poultry plants spent 5.6 cents, while meatpackers spent only 4.3 cents. In 1972, poultry plants spent only 0.2 cent more than meatpackers for fuel per dollar of value added. Poultry plants spent nearly twice as much per establishment in 1977 as meatpackers--$134,000 compared with $71,000.

1/ The value of shipments by manufacturers is considered comparable to cash sales by farmers, and value added by manufacture as comparable to the difference between farmers' cash sales and cash expenses.

Table 2--Costs of fuel and energy purchased by food industries

SIC code and industry grouping	Cost of fuel purchased per establishment			Cost of fuel purchased per production worker			Cost of fuel purchased per dollar value of shipments			Cost of fuel purchased per dollar of value added by manufacturer		
	1967	1972	1977	1967	1972	1977	1967	1972	1977	1967	1972	1977
	Dollars						Cents					
All manufactures	24,721	32,528	92,740	551	771	2,438	1.38	1.38	2.46	2.94	2.95	5.70
20 Food and kindred	20,346	31,401	95,206	590	815	2,368	.79	.77	1.32	2.48	2.48	4.53
201 Meat	18,519	29,344	71,217	366	520	1,271	.42	.41	.70	2.56	2.62	4.32
2011 Meatpacking	21,023	33,064	66,217	433	663	1,472	.36	.36	.55	2.55	2.76	4.30
2015 Poultry	21,352	38,804	134,391	232	302	920	.61	.66	1.22	3.06	2.83	5.63
2016 Poultry dressing	--	--	158,296	--	--	909	--	--	1.23	--	--	5.71
2017 Poultry and egg	--	--	64,706	--	--	1,010	--	--	1.16	--	--	5.16
202 Dairy	18,859	26,841	77,647	1,088	1,325	3,404	.91	.76	.80	3.37	3.04	5.16
2021 Butter	19,259	35,498	57,971	1,625	2,828	4,706	1.08	1.02	.89	9.19	9.96	10.73
2022 Cheese	11,988	19,839	75,095	741	840	2,676	.72	.54	.97	5.43	3.51	6.26
2026 Fluid	19,104	26,047	66,996	1,099	1,360	3,159	.85	.70	.94	2.83	2.56	4.06
203 Preserved fruits and vegetables	24,178	46,852	154,435	376	601	1,849	.92	1.04	1.81	2.38	2.65	4.77
204 Grain milling	27,358	37,565	121,558	1,125	1,474	4,665	.88	.95	1.66	3.04	3.13	5.58
205 Bakery	12,073	18,277	47,755	332	466	1,231	.82	.84	1.32	1.52	1.46	2.29
206 Sugar and confections	42,194	71,177	238,898	641	1,024	3,423	1.20	1.34	2.64	3.16	3.60	6.90
207 Fats and oils	57,229	97,445	314,039	1,833	2,863	9,251	1.12	1.21	1.88	6.20	6.49	14.29
208 Beverages	15,928	28,918	93,331	614	981	2,914	.77	.76	1.24	1.46	1.57	2.93
209 Miscellaneous	11,822	12,473	40,186	655	525	1,602	.85	.62	1.04	2.04	1.52	3.17

-- = Not available.

Source: Computed from data published in Census of Manufactures 1967, 1972, 1977 and Special Reports, Fuel and Electric Energy Consumed 1967, 1972, and 1977. 1972 report shows fuel and energy for 1971.

Rising fuel prices would increase costs for each food industry. The resulting changes in costs and returns would affect their relative competitive positions. The possibility of passing these increased costs on to the consumer through higher product prices also varies greatly, and creates further pressures on industry structure.

FUEL COSTS' INFLUENCE ON RETAIL PRICES

Transportation, wholesaling, and retailing functions also require energy. Breaking down costs by product and function becomes increasingly difficult at this point because of the complexity of joint costs involved. This study differentiates the energy used at four stages, from production through distribution. This differentiation, although limited in scope, illustrates how marketing and pricing practices respond to and interact with increased costs at different stages of production and marketing.

Costs of processing, wholesaling, and retailing increase with higher wage rates and prices of energy and other inputs. Retail food prices reflect changes in costs at all stages of production or marketing. General inflationary pressures influence these costs, but prices for each product or level are also subject to specific supply or demand pressures for individual foods which can cause costs and prices of food products to change at different rates (table 3). Although food product prices at wholesale tend to move up or down with farm level prices, operating costs for marketing firms have moved persistently upward and have been a major factor in rising food prices.

The marketing bill for U.S. farm foods was $123.5 billion in 1977, while the farm value of these foods was $56.5 billion. As both of these values have increased, so has the amount consumers have paid for farm-produced foods (tables 3 and 4). Although production, marketing, and consumer costs tend to increase together, farm value has not risen as steadily as the marketing bill and consumer expenditures. A comparison of year-to-year and 3-year changes illustrates the greater volatility of farm prices (table 4). The cost of those functions closer to the retail level tends to be less affected by farm level prices than by operating expenses. However, both higher farm level prices and higher marketing costs are reflected in the retail price.

Detailed information on cost components indicates that the combined wholesale and retail functions accounted for 10 to 52 percent of the retail price for 16 selected foods in 1977, with a simple average of 30 percent for these functions.2/ This combined wholesale-retail margin was 23.3 percent for dairy products, 29.0 percent for meat, 23.4 percent for poultry, and 46.7 percent for grain mill products (bread was used to represent grain mill products at this stage).

The dollar spent at retail by the consumer would be divided quite differently among the various production-marketing levels for the

2/ Taken from Developments in Farm to Retail Price Spreads for Food Products, U.S. Dept. of Agriculture, Economic Research Service, annual issues, 1974 to 1980.

Table 3--Prices and costs for selected foods, energy, and food production workers' earnings

Item	1967	1972	1977
		Cents	
Milk, half gallon retail	58.6	59.8	83.9
Net farm value 1/	25.4	29.4	45.8
Butter, pound retail	83.1	87.1	133.1
Net farm value 1/	59.8	63.8	91.5
Beef, choice pound retail	82.6	113.8	138.3
Net farm value 1/	53.0	72.5	79.9
Pork, pound retail	67.2	83.2	125.4
Net farm value 1/	34.8	47.9	73.4
Frying chicken, pound retail	38.1	41.4	60.1
Net farm value 1/	18.6	20.1	33.0
Eggs, grade A large, dozen retail	49.2	52.4	82.3
Net farm value 1/	29.0	29.9	53.8
Bread, white, pound retail	22.2	24.7	35.5
Net farm value 1/	2.8	2.8	4.5
		Dollars/million Btus 3/	
Purchased energy 2/	.67	.80	2.58
		Dollars	
Hourly earnings of production workers in food manufacturing, wholesale and retail trade	2.56	3.49	5.20
		Billion dollars	
U.S. farm foods:			
Consumer expenditures	90.2	122.2	192.3
Farm value 1/	28.8	39.8	58.0
Marketing bill	61.4	82.4	134.3
		Index 1967 = 100	
Market basket:			
Farm foods, retail	100.0	121.3	179.2
Farm value 1/	100.0	125.1	178.3
Farm-retail spread	100.0	119.1	179.7

1/ Net farm value for farm equivalent of retail unit.

2/ Energy price of 80 cents as reported for 1971. There was a 4-cent price increase in 1972 to 84 cents.

3/ Btus are British thermal units.

Sources: Various issues, Developments in Farm to Retail Price Spreads for Food Products and Census of Manufactures, Special Energy Reports.

Table 4--Farm value, marketing bill, and consumer expenditures for U.S. farm foods

Year	Farm value	Marketing bill	Consumer expenditures	Change from previous year: Farm value	Change from previous year: Marketing bill	Change from previous year: Consumer expenditures	Change from 3 years earlier: Farm value	Change from 3 years earlier: Marketing bill	Change from 3 years earlier: Consumer expenditures
	Billion dollars			Percent					
1967	28.8	61.4	90.2	--	--	--	--	--	--
1968	30.4	63.6	94.0	5.6	3.6	4.2	--	--	--
1969	33.4	64.1	97.8	9.9	.8	4.0	--	--	--
1970	34.8	71.2	106.0	4.2	11.1	8.4	20.8	16.0	17.5
1971	35.3	75.5	110.8	1.4	6.0	4.5	16.1	18.7	17.9
1972	39.8	82.4	122.2	12.7	9.1	10.3	19.2	28.5	24.9
1973	51.7	87.1	138.8	29.9	5.7	13.6	48.6	22.3	30.9
1974	56.4	98.2	154.6	9.0	12.7	11.4	59.8	30.0	39.5
1975	55.6	111.3	169.0	-1.4	13.3	9.3	39.7	35.1	38.3
1976	58.3	125.4	183.7	4.9	12.7	8.7	12.8	44.0	32.3
1977	58.0	134.3	192.3	- .5	7.1	4.7	2.8	36.8	24.4
1978	69.7	146.0	215.7	20.2	8.7	12.2	25.4	31.2	27.6
1979	80.6	164.5	245.1	15.6	12.7	13.6	38.2	31.2	33.4
1980 1/	86.0	183.0	269.0	6.7	11.2	9.8	48.3	36.3	39.9

-- = Not applicable.
1/ Preliminary.

four food groups (dairy, meat, poultry, and grain mill products). The consumer therefore might expect a variation in price changes among food products resulting from a given rise in fuel prices. These differences are approximated by starting with a $1 retail value for each of the four food groups and working backward through processing and farm production to the purchased farm inputs, showing the value of shipments, value added, cost of inputs, and the fuel cost at each stage (table 5). Purchased inputs for each stage are assumed to be the corresponding sales of that product from the preceding stage. Further refinements could be made, but this breakdown provides a meaningful approximation of cost-sales relationships.

This technique enables one to trace through the production-marketing system and determine the proportion of cost each phase contributes to the production of the final product for which the consumer pays $1 at retail. It is then a simple matter to reverse the process, starting with the value of purchased inputs used by farmers to produce that quantity of the commodity (as defined in table 5), and moving forward through the production-marketing complex, observing the sequential impact of a price change.

Assuming no significant change in production processes or in the quantities of fuel used, the expected impact on the price of each food group if fuel prices doubled is illustrated in table 6. This breakdown, using the value that each sector adds to the product (as shown in table 5), starts with the inputs purchased by farmers and works forward through the production-marketing system. If the 1977 cost of fuel is doubled, then the cost of purchased inputs is increased by that amount. This same increase in cost is then assumed to be passed on to the next stage in the system, thus having a cumulative effect on the cost of inputs at each successive stage. Following this procedure, alternative A in table 6 shows that doubling fuel costs would lead to a 7.7-percent increase in the retail price of dairy products, a 6.6-percent increase in meat products, 7 percent for poultry, and only 3.6 percent for grain mill products.

A more likely series of effects is represented by alternative B. Due to markup practices and cost changes associated with inventory values, retail prices would probably increase more than the absolute amount of the added fuel cost. If the increased costs were added to the 1977 cost, and existing cost-price relationships (percentage margins) were maintained, then price increases at retail would be greater than the cumulative increase in fuel costs.

Both alternatives A and B represent possible retail prices for the same product which cost consumers $1 in 1977. The prices shown in the last two columns represent possible absolute and percentage increases, which are the differences between the retail prices in table 6 and the 1977 retail sales price of $1.

The cumulative absolute increase in fuel costs at all stages of production and marketing would be twice as much for poultry

Table 5--Production and marketing energy costs per dollar of retail sales of dairy, meat, poultry, and grain mill products, 1977

Food group	Function or stage of production			
	Wholesale and retail 1/	Processing and distribution 2/	Farm production and shipping 3/	Purchased farm inputs
	Cents			
Dairy products:				
Total sales	100.0	76.7	60.1	46.6
Cost of inputs	76.7	60.1	46.6	26.5
Value added	23.3	16.6	13.5	20.1
Fuel cost	3.0	.6	3.0	1.1
Cumulative fuel 4/	7.7	4.7	4.1	1.1
Cumulative fuel as a percentage of sales (percent)	7.7	6.1	6.8	6/ 2.5
Meat products:				
Total sales	100.0	71.0	59.5	51.2
Cost of inputs	71.0	59.5	5/ 51.2	29.1
Value added	29.0	11.5	8.3	22.1
Fuel cost	3.0	.5	1.8	1.3
Cumulative fuel 4/	6.6	3.6	3.1	1.3
Cumulative fuel as a percentage of sales (percent)	6.6	5.1	5.2	6/ 2.5
Poultry products:				
Total sales	100.0	76.6	60.1	46.9
Cost of inputs	76.6	60.1	46.9	26.7
Value added	23.4	16.5	13.2	20.2
Fuel cost	3.0	.9	1.9	1.2
Cumulative fuel 4/	7.0	4.0	3.1	1.2
Cumulative fuel as a percentage of sales (percent)	7.0	5.2	5.2	6/ 2.5
Grain mill products:				
Total sales	100.0	53.3	37.5	22.7
Cost of inputs	53.3	37.5	22.7	12.9
Value added	46.7	15.8	14.8	9.8
Fuel cost	.5	.9	1.6	.6
Cumulative fuel 4/	3.6	3.1	2.2	.6
Cumulative fuel as a percentage of sales (percent)	3.6	5.8	5.9	6/ 2.5

1/ Current estimated fuel costs for food retailing are 1.1 percent of sales. Estimates for wholesaling plus fuel portion of transportation for wholesaling and retailing are allocated to product groupings.

2/ Computed from data in Census of Manufactures, General Summary, U.S. Dept. of Commerce, Bureau of Census, 1977.

3/ Farm production costs were calculated from the "1978 Summary of Illinois Farm Business Records," and unpublished ERS data.

4/ Cumulative fuel is the sum of fuel costs up to and including each stage of production and marketing.

5/ Adjusted to reflect farm production of purchased feeder livestock.

6/ Average for all manufactures (2.46 percent of sales or 5.70 percent of value added).

Table 6--Possible impacts of increased energy costs on the price of selected food products

Item	Purchased farm inputs		Farm production and shipping		Processing and distribution		Wholesale and retail	
	A 1/	B 1/	A 1/	B 1/	A 1/	B 1/	A 1/	B 1/
	Cents							
Dairy products:								
Sales or shipments	47.7	48.2	64.2	66.0	81.4	85.0	107.7	114.7
Cost of inputs	27.6	27.6	50.7	51.2	64.8	66.6	84.4	88.0
Value added	20.1	20.6	13.5	14.8	16.6	18.4	23.3	26.7
Fuel cost	2.2	2.2	6.0	6.0	1.2	1.2	6.0	6.0
Cumulative fuel cost as a proportion of sales (percent)	4.6	4.6	12.8	12.4	11.5	11.1	14.3	13.4
Meat products:								
Sales or shipments	52.5	53.5	62.6	64.3	74.6	77.3	106.6	113.1
Cost of inputs	30.4	30.4	54.3	55.3	63.1	64.8	77.6	80.3
Value added	22.1	23.1	8.3	9.0	11.5	12.5	29.0	32.8
Fuel cost	2.6	2.6	3.6	3.6	1.0	1.0	6.0	6.0
Cumulative fuel cost as a proportion of sales (percent)	5.0	4.9	9.9	9.6	9.7	9.3	12.4	11.7
Poultry products:								
Sales or shipments	48.1	49.0	63.2	65.2	80.6	84.2	107.0	113.8
Cost of inputs	27.9	27.9	50.0	50.9	64.1	66.1	83.6	87.2
Value added	20.2	21.1	13.2	14.3	16.5	18.1	23.4	26.6
Fuel cost	2.4	2.4	3.8	3.8	1.8	1.8	6.0	6.0
Cumulative fuel cost as a proportion of sales (percent)	5.0	4.9	9.8	9.5	9.9	9.5	13.1	12.3
Grain mill products:								
Sales or shipments	23.3	23.8	39.7	42.0	56.4	60.9	103.6	115.2
Cost of inputs	13.5	13.5	24.9	25.4	40.6	42.9	56.9	61.4
Value added	9.8	10.3	14.8	16.6	15.8	18.0	46.7	53.8
Fuel cost	1.2	1.2	3.2	3.2	1.8	1.8	1.0	1.0
Cumulative fuel cost as a proportion of sales (percent)	5.2	5.0	11.1	10.5	11.0	10.2	7.0	6.2

1/ These estimates deal only with the impact of doubling fuel and energy prices. Alternative A passes the increased cost through the system while alternative B adds in the increased cost of fuel and maintains the 1977 percentage relationship between cost of inputs and sales. Computations based upon table 5. Sales at retail compare with $1 of retail sales in table 5, the difference shown in the last two columns representing the price increase for each alternative.

products (7.0 percent) as for grain mill products (3.6 percent). However, adjusting these increases at each stage by the existing percentage marketing margin would result in a greater price increase for grain mill products (15.2 percent) than for poultry (13.8 percent). Surprisingly, the differences in price changes among commodities would not be quite as great under alternative B as they would be if absolute cost increases were simply passed on through the system.

These comparisons emphasize that the price impact of changes in energy prices will vary among foods, depending both on the cost of fuel used and the pricing patterns followed. Differences in pricing practices may outweigh differences in absolute cost increases. This may be especially noticeable for items which are not major production or marketing costs.

This study suggests that the commonly used methods of measuring fuel costs, a percentage of cash sales or expenses, may understate the impact expected on retail prices if the price of fuels and energy were to double. These methods tend to err on the low side for two reasons. First, the practice that considers the cost of fuel used at a given level (production or manufacturing) as a percentage of sales rather than as a proportion of value added at each stage minimizes the significance of the change in cost as a product moves through the system. Secondly, forecasts frequently consider energy cost as an absolute amount to be added to the retail price and neglect to acknowledge possible differences in markup practices (percentage markups) employed by marketing firms at all stages of the food system. Considering their interaction, these two factors could result in significantly greater price changes at the retail level. The differences may be sufficient to lead suppliers and customers to alter past response patterns and rates, thereby bringing about additional changes in price and structural relationships of various food industries.

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